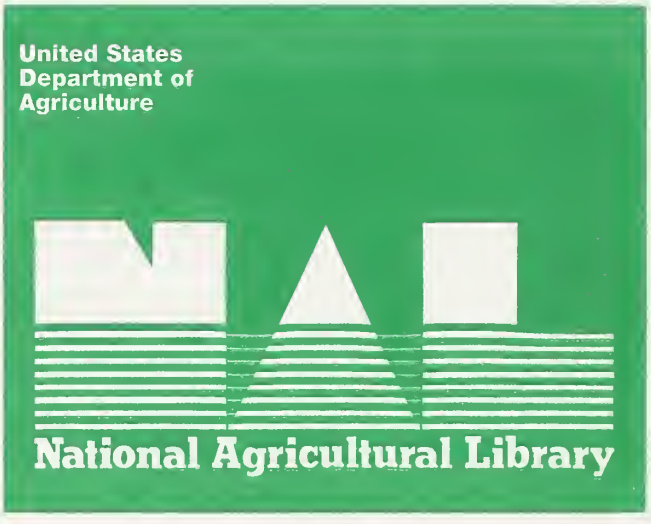


AGRICULTURAL
Research
U.S. DEPARTMENT OF AGRICULTURE

July 1964

Floyd DeEds

DISTINGUISHED SERVICE AWARDS *Par Excellence* . . . *page 8*

- Floyd DeEds, Albany, Calif.
- Dialdehyde Starch Research Team, Peoria, Ill.
- Wash-Wear Cotton Research Team, New Orleans, La.

AGRICULTURAL
Research

July 1964/Vol. 13, No. 1

Know Bill Jones?

The secretary paused momentarily from typing a personnel form for scientist Bill Jones, and spoke to a colleague: "Did you know that Dr. Jones is an international authority?"

A hypothetical case? Not at all. There isn't anything hypothetical about the ability and achievement of ARS employees (see "Par Excellence," page 3, this issue). You may know a Mr. Jones—or a Mrs. Smith—right in your office or your town.

Dr. Jones might be Floyd DeEds, pharmacologist at the Western utilization research laboratory, Albany, Calif., who was awarded the USDA Distinguished Service Award by Secretary Freeman recently in Washington, D.C. During his more than 30 years in USDA, he has earned worldwide recognition as an agricultural scientist in the varied fields of toxicology, pharmacology, and biochemistry. He has long been a principal ARS expert in evaluating health hazards of chemical additives in foods.

In addition to his many individual achievements, Dr. DeEds and his group at Albany discovered the cancer-producing properties of a chemical (acetaminoflourene) now widely used in cancer research. This was a team effort, just as was the work that also earned the Department's Distinguished Service Award for the Northern laboratory team that developed dialdehyde starch and the Southern laboratory team that developed wash-wear cotton.

Research by these award winners—and those in ARS who received the 14 individual and group Superior Service Awards—can't help but have widespread impact on our lives. Results of their work benefit our nutrition and health, our comfort and safety, and the overall economic and social well being of this Nation.

Our congratulations to all of the honorees—and to the many other dedicated ARS employees, whose achievements add up to a job well done.

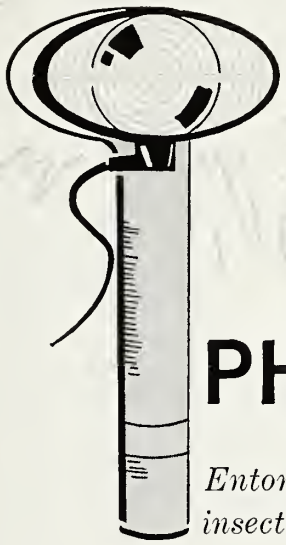
Contents

Editor: R. E. Enlow
Contributors to this issue:
W. E. Carnahan, M. K. Dickson, A. J. Feeney, E. J. Fitzgerald, D. W. Goodman, W. W. Martin, J. N. Miller, J. G. Nordquist, H. H. Smith, J. M. Singer

AGRICULTURAL RESEARCH is published monthly by the Agricultural Research Service, United States Department of Agriculture, Washington, D.C., 20250. Printing has been approved by the Bureau of the Budget, August 15, 1958. Yearly subscription rate is $1 in the United States and countries of the Postal Union, $1.50 in other countries. Single copies are 15 cents each. Subscription orders should be sent to Superintendent of Documents, Government Printing Office, Washington, D.C., 20402. Information in this periodical is public property and may be reprinted without permission. Mention of the source will be appreciated but is not required.

Orville L. Freeman, Secretary,
U.S. Department of Agriculture

B. T. Shaw, Administrator,
Agricultural Research Service



PHOTOFLASH

Entomologists use light to upset insect cycle, prevent dormant stage

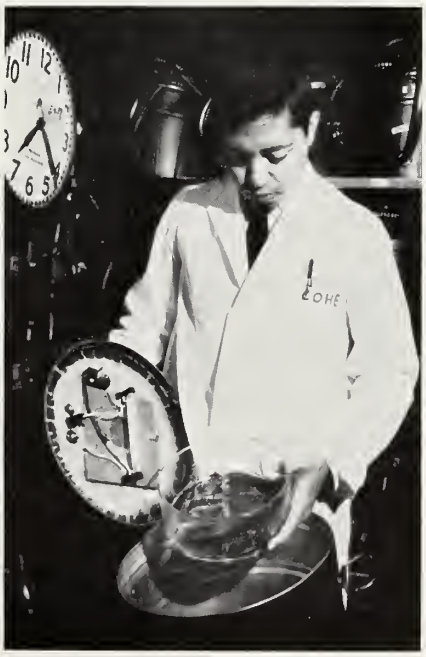
■ ARS insect physiologists have upset the normal life cycle of a test insect by exposing it to flashes of light lasting less than one one-thousandth of a second.

Photoflashes given nightly during the larval stage of growth upset the growth sequence later in the life cycle; the insect developed from a pupa into an adult at a time when it normally would have entered a dormant stage called diapause. The entomologists say that if insects in their natural environment were forced to bypass diapause and develop into adults "ahead of schedule," the insects probably would be so badly out of step with nature that they would perish.

The ARS scientists conducted the research at Beltsville, Md., with the imported cabbageworm (*Pieris rapae*).

Diapause is a physiological state comparable to hibernation. Not all insects diapause, but it is a vital phase in the life cycle of many of our major insect pests. Diapause is directly controlled by hormones, and the activity of these hormones is influenced by environmental conditions such as temperature, humidity, and hours of daylight and dark.

The ARS findings do not prove that photoflash can be used to control insects under field conditions. But the new knowledge should heighten research interest in photoflash as a possible means of control.



Imported cabbageworms confined in 5-gallon containers were treated with light in the basic ARS studies on insect physiology. The light unit, controlled by an automatic timer, is in the lid of this container.

Basic studies to precede field use

Light sources are now available that make light treatments in the field feasible. Commercial xenon and mercury lamps furnish enough illumination. Someday, scientists may want to conduct experiments with mobile—even airborne—lights to see if they can stop development of natural insect populations. But much additional basic information is needed before they know how extensively photoflash might be used as a practical control method.

The ARS scientists point out one fact, however, that could have great practical significance: Light treatments that alter insect development have little or no effect on plant development.

Many plant-growth processes can

be controlled by exposing plants to flashes of light during the night. But the kinds of light that affect plants and insects are quite different. Red light is most effective on plants, and green light is most effective on insects.

The ARS physiologists learned by trying various light treatments that proper timing of the photoflashes is essential for preventing diapause in the cabbageworm. In a day-night cycle set at 10 hours of light and 14 hours of darkness (to simulate light conditions that naturally induce diapause), flashes of light prevented diapause only if given during a particular period in the day-night cycle. This period, which lasted about 1 hour, occurred 3 to 4 hours after the end of the 10-hour day.

Although the imported cabbageworm diapauses in the pupal stage of growth, diapause is triggered by light that falls on the larval stage.

In one experiment, only 3 of 139 test insects diapaused when larvae got the daily photoflash treatments. By contrast, 100 of 105 insects diapaused when the 14-hour dark period was not interrupted by light.

Light duration is greatly reduced

Using supplemental light to prevent insect diapause is not a new experimental procedure. Findings in the recent ARS experiments, however, are an impressive advance in one important respect: The duration of the effective light period is only a fraction of that previously known to inhibit diapause.

A few months ago the ARS scientists reported that interrupting the dark period with 8 minutes of light prevented diapause in the imported cabbageworm—a considerably shorter effective exposure than any that had been previously reported. Now, the exposure time has been reduced to a fraction of a second.

Photoflash could be effective in ways other than preventing diapause. ARS scientists believe it might be possible, for example, to *cause* diapause at a time that would fatally upset the life cycle of some insects.☆

Green Feeding of Lambs...

Practices prove efficient, particularly for humid areas

■ Lambs fed soilage (roughage cut and fed green) made about the same average daily gain in ARS tests as lambs on clean pasture, and they gained more than those on contaminated pasture.

This research finding could be important to farmers in humid areas where internal parasites are a major problem with sheep and high land values make frequent pasture rotation impractical. Since soiling, or zero grazing, of dairy cattle is practiced in many of these areas, a combined dairy-lamb feeding operation might be economically sound.

The soilage experiment is part of long-term ARS research designed to evaluate various management practices for control of internal parasites in lambs.

At Beltsville, Md., animal husbandmen I. L. Lindahl, Charlie Jackson, Jr., P. W. Kerns, and E. B. Kelley divided 437 lambs and their dams into four treatment groups when the lambs averaged about 60 days of age. Four days before going on the experimental treatments, all ewes were given a therapeutic dose of phenothiazine.

Lambs in group I were kept in a barn or drylot at all times and were fed soilage free choice plus a limited amount of creep pellets. Ewes were kept in drylot at night and allowed to graze during the day.

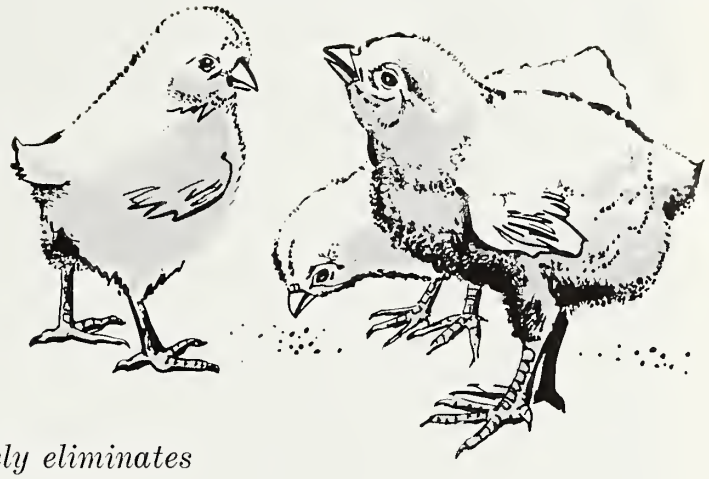
Ewes and lambs in group II were turned on pasture on April 12 and at intervals, not exceeding 14 days, were moved to new pasture that had not been grazed previously during the year.

Ewes and lambs in groups III and IV were also turned on pasture on April 12, but they were given free choice among pastures. Choice of grazing area was influenced by availability of forage, and the two groups regrazed their respective pastures at frequent intervals. Ewes in group III were treated with N.F. phenothiazine and ewes in group IV with purified phenothiazine—the only difference in management.

Lambs were weaned when they reached 120 days of age. Gains made during the test averaged 0.51 pound per day for lambs fed soilage, 0.53 pound for lambs on clean pasture, and 0.42 pound for lambs on parasite-contaminated pasture.

Soilage for group I was cut daily and average consumption of soilage per day was measured on a green and dry-matter basis. Average daily consumption per lamb increasd during the tests from 3 pounds (0.65 pound dry matter) in late April, when tabulations were begun, to about 8 pounds (1.25 pounds dry matter) in late June, when the lambs were weaned.

Winter wheat was used as the source of soilage and pasturage during the first two weeks, followed by a mixture of ladino clover and orchard grass for the remainder of the tests.☆



LEUKOSIS

Removal of gland from chicks largely eliminates cancerlike big-liver disease

■ Surgical removal of the bursa gland in chickens has, in most cases, prevented them from contracting visceral lymphomatosis, say ARS scientists and cooperating physicians.

After the gland, called bursa of Fabricius, was removed from 160 chickens, only 6 of them died of this cancerlike disease. In contrast, the disease was fatal to 97 of 235 chickens that did not receive the gland surgery.

These results were obtained in a series of basic studies at the Regional Poultry Research Laboratory, East Lansing, Mich., on the role that the bursa and thymus glands play in the contraction or rejection of visceral lymphomatosis. The research is supported in part by grants from the American Heart Association, the American Cancer Society, the National Science Foundation, and the U.S. Public Health Service.

No lymphomatosis developed among chickens that had both the bursa and the thymus glands removed, but removal of only the thymus gland had no detectable effect on the incidence of the disease.

Visceral lymphomatosis, or big-liver disease, is one form of avian leukosis, which is practically always fatal. It is a major problem in the poultry industry, causing yearly losses estimated at $60 million.

A line of chickens susceptible to the disease has been maintained at the East Lansing laboratory for several years. In this line, a cultured leukosis virus, RPL 12, produces a predictable incidence of big-liver disease.

Surgery was performed on young chickens to remove the bursa, the thymus, or both. Neither gland was removed from a group of chicks maintained as controls. All were inoculated with the virus, some before surgery and some after.

The growth and development was not affected by the surgery.

Although the different surgical treatments had no effect on the number of deaths from other forms of leukosis, the incidence of visceral lymphomatosis varied markedly and consistently depending on the surgery performed.

Bursa removal was effective whether the operation was at 2 or 29 days of age and whether the chickens were infected at 1 day or 28 days of age. Even when the virus was administered to day-old chicks and the operation was performed 4 weeks later, bursectomy drastically reduced the incidence of visceral lymphomatosis. This is particularly significant because the RPL virus multiplies in chickens to such an extent that much virus can be found in saliva and droppings by 4 weeks of age.

Of considerable interest was the failure of either or both thymectomy and bursectomy to influence the incidence of other forms of leukosis. Previous research has shown that RPL 12 virus takes different forms in chickens, depending on virus dosage and age of infected chicken.

Cooperating in these studies, which are continuing, are R. D. A. Peterson, Established Investigator, American Heart Association; B. R. Burmester, T. N. Fredrickson, and H. G. Purchase of the East Lansing laboratory; and R. A. Good, American Legion Memorial Heart Research Professor of Pediatrics and Microbiology, University of Minnesota School of Medicine.

The scientists say that even though relatively few birds were used in the surgery test, the differences were so marked and consistent that they indicate a definite trend, and add a new dimension to research on avian leukosis.☆

Basic studies are improving . . .

STUBBLE MULCHING

■ Improving an erosion-control practice already as effective as stubble mulching is a big order, but that's the task ARS scientists are undertaking.

Stubble mulching is a method of managing crop residues to insure soil protection, moisture conservation, and sustained crop production. Initial tillage is usually done by subsurface implements that loosen the soil and leave stubble and stalks on the soil surface.

Correctly done on small-grain fields in Great Plains and Western States, stubble mulching prevents about 80 percent of the soil loss during intense rainfall, reduces by half the amount of moisture lost as runoff, and removes up to 90 percent of the wind's erosive force at the soil surface.

Though it is widely used, some farmers hesitate to adopt stubble mulching because grain yields are sometimes decreased, especially in seasons of above-normal rainfall and in the more humid parts of the Great Plains. Even a small yield reduction is important to these farmers, who operate on small profit margins.

"We know that stubble mulching is needed for protecting 65 million acres of land," says ARS soil scientist C. J. Whitfield, Ft. Collins, Colo. "We also know that 36 million acres in the Great Plains were damaged by wind action in 1954–57."

Whitfield is directing basic studies on the effects of stubble mulching on the physical and chemical properties of the soil and on the action of soil micro-organisms. From these studies, the scientists hope to get information on how to provide more nearly ideal growing conditions in stubble-mulched fields.

The basic information will also help them develop recommendations on how to use new or improved implements for stubble mulching. Much of the earlier research dealt with the performance of tillage tools of that period. Many of these results are not readily adaptable to implements farmers use on large acreages today.

The scientists say that, under certain circumstances, yield reduction where stubble mulching is practiced appears to be related to such influences as the amount of stubble (which affects soil temperature), nitrogen availability, toxic substances, the physical condition of the soil, and moisture supply.

One line of investigation beginning this year at Akron, Colo., concerns the ideal amount of stubble to incorporate in the soil. The amount of residue apparently affected wheat growth in earlier research at Akron and at North Platte, Nebr., where plants on high-residue plots were smaller and less vigorous than those on low-residue plots.

At Sidney, Mont., on plots where snowmelt furnished additional mois-

ture, soil that was not protected with stubble mulch cracked—and winterkill reduced yields. Plots with a protective cover of residues had no soil cracking, less winterkill, and better yields.

In other phases of the studies—

- The researchers are evaluating the effect of stubble mulching on soil nitrogen supply at seeding time. Micro-organisms use soil nitrogen in decomposing residue. Hence, incorporating residues in the soil at seeding time could result in a shortage of available nitrogen during the early stages of plant growth.
- Soil scientists at North Platte, are comparing three amounts of stubble and three levels of nitrogen fertilization. If the well-fertilized, stubble-mulch plots do not yield as well as plots with the same amount of nitrogen—but no stubble mulch—the researchers will investigate other possible causes of the reduced yield.
- Microbiologists at Lincoln, Nebr., have identified a toxic substance present in crop residues. Its significance under field conditions is still to be determined, as are the effects of toxic substances that either are in the soil or are produced by soil microorganisms.
- Scientists at various Great Plains locations are investigating when to begin tillage for maximum moisture conservation. The amount of residue, for example, may influence the timing.

Although fall tillage kills annual weeds early, it may stimulate undesirable volunteer grain growth. Spring tillage results in less volunteer growth, but weeds have longer to become established and use up valuable soil moisture. The scientists are measuring the soil's water infiltration rate and the amount of weed and volunteer grain growth to determine which is more wasteful of moisture, spring or fall tillage.☆

LIMIT ON LENGTH ?

■ How long should a lean-type hog be? An ARS carcass evaluation study has shown there may be an upper limit.

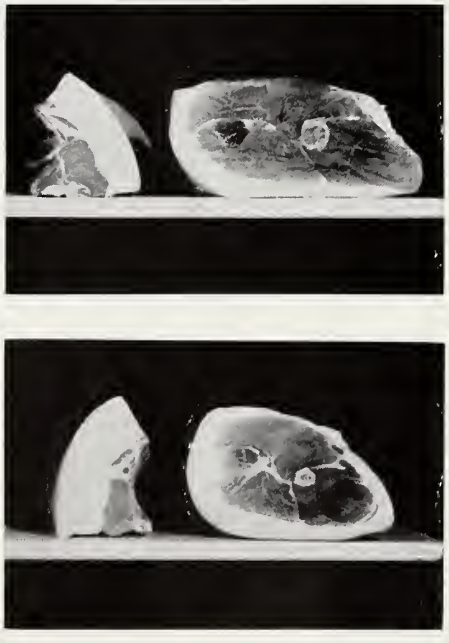
Results of the study—on effect of carcass length on pork yield and composition—indicate that a carcass length of 31 inches is most desirable for lean meat production. This finding could be important to hog breeders in their attempts to produce better lean-type hogs and to packers in their attempts to meet specific market demands.

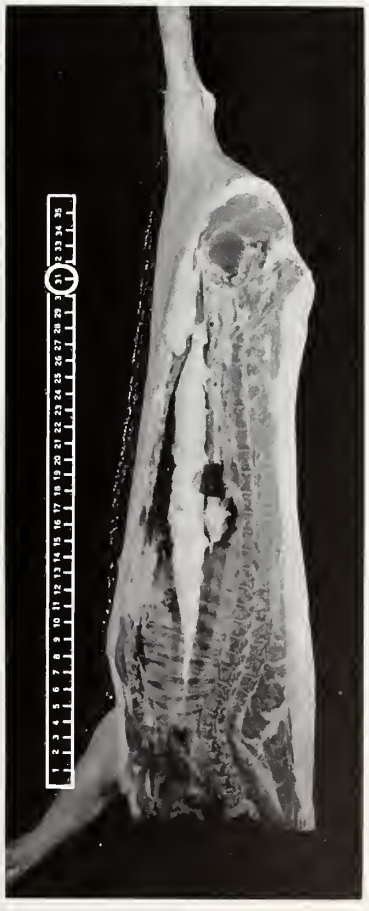
Food technologist R. L. Hiner and statistician J. W. Thornton evaluated 473 carcasses of Duroc and Yorkshire breeds at the Meat Quality Laboratory, Beltsville, Md.

As carcass length increased, they found a consistent decrease in fat cuts and average backfat thickness and an increase in loin-eye-muscle area and pounds of lean cuts—until carcasses reached 31 inches. Beyond this length, loin-eye-muscle area and pounds of lean leveled off and in some cases decreased.

All hogs were raised on the same standard fattening ration to a slaughter weight of 225 pounds. Carcass lengths varied from 26 to 35 inches.☆

Progress made in developing meat-type hogs is seen graphically below. Pork cuts in the top picture are from a carcass that was 30.1 inches long; those at bottom, from one only 26.4 inches long. Now, for highest percent lean, researchers say the limit may be 31 inches.





USDA HONORS INDIVIDUALS AND GR

■ Three Distinguished Service Awards and fifteen Superior Service Awards were presented to individuals and work units of ARS at USDA's 18th annual honor awards ceremony held recently in Washington, D.C.

Secretary of Agriculture Orville L. Freeman announced the citations for high achievement in research, regulatory, and administrative work. One 50-Year Length of Service Award was received by an ARS employee.

Wash-Wear Cotton Research Team: (left row, top to bottom) G. L. Drake, Jr., R. M. H. Kullman, C. M. Welch, J. G. Frick, Jr., W. A. Reeves; (center row) V. W. Tripp, L. H. Chance, Ruth R. Benerito, J. B. McKelvey; (right row) L. W. Mazzeno, Jr., S. L. Vail, J. D. Guthrie, R. M. Reinhardt, and J. D. Reid. The award also goes to the late R. L. Arceneaux.

For Distinguished Service

Floyd DeEds, *Western Utilization,* for distinguished research leadership in the sciences of pharmacology, toxicology, and biochemistry, resulting in important advances in understanding of metabolic processes and significant contributions to agriculture and the Nation. (See editorial, page 2, this issue.)

Dialdehyde Starch Research Team, *Northern Utilization,* for creative research and development on the utilization of cereal starches, resulting in the production of dialdehyde starch and its commercial use in making wet-strength paper.

Wash-Wear Cotton Research Team, *Southern Utilization,* for outstanding basic and applied research that has materially aided industry by extending fundamental knowledge of cross-linking—and for developments that have led to high-quality cotton wash-wear textile products, thereby increasing markets for cotton.

Dialdehyde Starch Research Team: (bottom row, left to right) F. R. Senti, C. E. Rist, E. L. Griffin, Jr., T. R. Naffziger, A. J. Ernst, L. D. Miller, V. E. Sohns; (middle row) D. J. Kay, J. C. Rankin, C. L. Mehltretter, H. F. Conway, D. E. Smith, E. B. Lancaster, B. T. Hofreiter; (top row) P. R. Watson, G. E. Hamerstrand, L. A. Pope, T. E. Yeates, V. F. Pfeifer, K. R. Majors, L. E. Talley, and H. L. Griffin. Not pictured: W. D. McClay, D. L. Miller, and I. A. Wolff.

For Superior Service

Elmer R. Ausemus, *Crops,* for unusual effectiveness and leadership in breeding high-quality, rust-resistant spring wheat varieties, including "Crim," for establishing more efficient wheat breeding procedures; and for training wheat research workers.

Tom A. Brindley, *Entomology,* for developing effective, safe, and economical methods for controlling the European corn borer, the most destructive insect pest of corn in the United States.

Francis P. Hanrahan, *Eastern Utilization,* for an outstanding contribu-

PS ... Par Excellence

tion to the utilization of milk through the discovery of a new drying process by which improved nonfat dry milk and whey powder are now produced commercially.

Josephine E. Lauth, *Office of Administrator*, for outstanding contributions to developing and maintaining a radiological monitoring capability in the USDA.

William Q. Loegering, *Crops*, for developing and leading uniquely effective national and international research programs that have contributed tremendously to cereal rust control on a worldwide basis and for conducting research of great significance on the cereal rusts.

Roy G. Richmond, *Plant Pest Control*, for leadership in the formulation and execution of programs that confined infestations of introduced plant pests without interrupting orderly marketing and free movement of agricultural commodities.

Louis D. Romberg, *Crops*, for outstanding perception in both developing a breeding program for pecans and in developing superior varieties.

Ruebush G. Shands, *Crops*, for research achievement in identifying and incorporating genes for disease and insect resistance from wild and cultivated sources into barley and wheat breeding stocks and commercial varieties.

John H. Weinberger, *Crops*, for outstanding perception in recognizing regional needs for improved stone fruit varieties and unusual success in incorporating these objectives in the production of improved varieties.

Acetoglycerides Research Unit, *Southern Utilization*, for outstanding service in expanding the utilization of edible vegetable oils by research resulting in the development of new fat products, the acetoglycerides, having unique properties and potentially important applications.

Ausemus

Analytical Investigations, *Entomology*, for meritorious service to agriculture and protection of the consumer through outstanding contributions in developing and using sensitive, specific chemical methods to detect the presence of insecticide residues in plant and animal products.

Cotton Gin Research Unit, *Agricultural Engineering*, for the development and demonstration of an automatic moisture-control system for cotton gins.

Hawaii Fruit Fly Investigations Unit, *Entomology*, for outstanding research in developing and demonstrating the effectiveness of new approaches for the control and eradication of subtropical fruit flies.

Interior Design Unit, *Clothing and Housing*, for outstanding achievement in applying basic data on housing requirements to the development of functional designs for energy-saving kitchens that have brought national and international recognition to the Department.

Isotope Removal Investigations Group, *Eastern Utilization*, for an outstanding contribution to the National Emergency Program of the Department through the development of a practical process for removing radiostrontium from milk. (This group consists of 11 ARS scientists and 6 U.S. Public Health Service scientists.)

Brindley

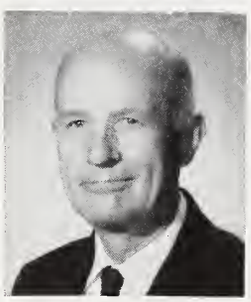
Hanrahan

Lauth

Loegering

Richmond

Romberg



Shands

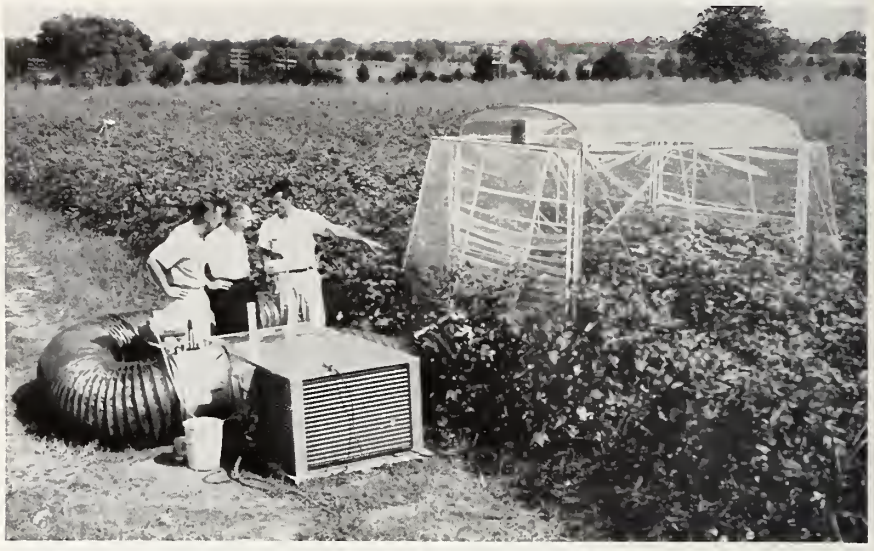
Weinberger

For 50 Years of Service

John J. Martin, *Animal Disease Eradication*, led recipients of Length of Service Awards, with 50 years. Thirty awards were presented ARS employees with 40 years of service. ☆

DETERMINING COTTON MICROCLIMATE

Armed with new facts, soil scientists will develop best cultural practices



ARS soil scientist Baker (right) discusses microclimate chamber with vice president W. L. Giles (center) and agronomist L. E. Nelson, both of Mississippi State University. About 25 plants are enclosed in the chamber, through which air is circulated in a closed circuit to control wind velocity, temperature, and humidity.

■ What is the ideal combination of light, temperature, moisture, and air movement for best cotton growth, yield, and defense against insects and diseases?

Nobody knows precisely, but ARS soil scientist D. N. Baker intends to find out.

Scientists have long known the general climatic requirements affecting cotton production. Now, with recently developed techniques and equipment, Baker is extending this knowledge to the environment, or microclimate, within a few feet of the tops and roots of cotton plants.

When he has identified the ideal microclimate, the soil scientist will develop and test cultural practices for creating those optimum conditions.

Scientists team up against weevil

Baker is stationed at the Boll Weevil Research Laboratory, State College, Miss., where soil and crop scientists have teamed up with entomologists to explore new research approaches to the boll weevil problem. The laboratory is operated in cooperation with the Mississippi Agricultural Experiment Station.

Data from Baker's research on microclimate may also help ARS entomologists at the laboratory in their search for new means of controlling boll weevils. They will investigate the possibility of manipulating the microclimate to influence the dissemination from cotton plants of gaseous materials that attract the weevils (AGR. RES., Sept. 1962, p. 7).

Creating an unfavorable climate

The entomologists might create an environment within cotton fields, for example, that is less attractive to weevils. Or it might be possible, on the other hand, to create cotton plants that give off a high content of the attractant and serve as "decoys" that lure weevils away from the main crop.

The microclimate in crop stands can be manipulated to advantage, previous research has demonstrated. Baker found that row orientation with respect to the path of the sun may affect the amount of light penetrating to the ground. This, in turn, affects rates of photosynthesis in the plants and water loss from the soil surface, as well as the rate of drying of fallen weevil-infested squares (unopened cotton flower buds).

Trimming rows improves quality

Topping and vertical trimming of cotton rows by ARS soil scientist O. L. Bennett at Thorsby, Ala., altered light interception by the stand and may have affected the movement of carbon dioxide and water vapor. This treatment improved both yields and quality of lint, compared with those of untrimmed plots.

Baker is now studying the effects on microclimate of four variables—row direction, irrigation, trimming and topping plants, and stand density. He is recording the effects in terms of percent of light interception by the stand, air and soil temperatures, relative humidity, and net radiation.

(Net radiation is the heat available for evaporation from soil and transpiration from plants. It is the difference between incoming radiation from the sun and outgoing radiation—from the soil or reflected by surfaces.)

Transducers that measure each of these variables are installed in each

treatment area of a field several itmes during the growing season. These sensing elements provide signals that are averaged over 15-minute periods by a data-recording system located in an instrument trailer at the edge of the field.

No conclusions have yet been drawn from this phase of the research.

Baker is also isolating and studying the effects on plants of several elements of the microclimate. These studies are made in a portable plastic chamber that encloses about 25 cotton plants in the field. The chamber is equipped for controlling temperature and humidity and for maintaining wind speeds at different velocity levels and at different elevations above the ground.

Light intensity and photosynthesis

Studies indicate that photosynthesis increases in cotton plants as light intensity rises. And under the same conditions of temperature and humidity, cotton plants use solar radiation in the manufacture of carbohydrates most efficiently early in the day, the efficiency decreasing as the day progresses.☆

Hopper Control

■ Grasshopper control operations this summer are benefiting from two seasons' special studies that verify the effectiveness of a new formulation of malathion insecticide.

Malathion has special merit for rangeland use because its residue lasts for only a few days after application. This safety characteristic permits less complicated livestock management on treated acreage than is possible when more persistent chemicals are used.

The new formulation—being used for the first time this year—has proved consistently effective in field trials when applied undiluted at a rate of only 8 to 10 ounces per acre. In the past, the standard rate of various recommended insecticides and diluents was a gallon per acre.

To get appropriate coverage at the low application rate required only minor adjustments in standard boom-and-nozzle equipment. But, first, a major adjustment was required in the realm of ideas—in conceiving that an acre of land can be adequately covered with no more than the amount of liquid in a half-pint milk carton.

A pilot using the new malathion formulation on large acreages at the low dosage rate can treat four times as much rangeland per day as was done with previous insecticides. Aircraft loading and ferrying time is reduced approximately 90 percent.

Tests using low-gallonage sprays were conducted successfully with both small and large aircraft, but the greatly increased efficiency of application means that small planes will become more important in rangeland grasshopper control work. This results in more precise application.

A final obstacle to using the low-volume, undiluted malathion was a variation in flow rate—caused by a variation in the insecticide temperature—which resulted in uneven application. This obstacle was overcome when equipment specialists determined that the flow rate could be stabilized by using higher spray pressure and flat spray nozzles.

Surveys indicate that grasshoppers were present, in varying intensities, on approximately 10 million acres of rangeland in the fall of 1963. Seasonal development of infestations determines the areas where control work is necessary. ARS cooperates with State and local groups in carrying out operations against the pest.☆

Caution: In using insecticides, follow directions and heed precautions on the label, particularly where there is danger to wildlife or possible contamination of water supplies.

ARS soil scientist M. A. Gallatin checks the salt content of brackish water—a necessary first step before using the water for irrigation.

Vegetable growers save crops by following research that tells how to irrigate with . . .

Brackish Water

■ Consumers supplied by the important vegetable-producing area on the eastern shore of Chesapeake Bay were direct beneficiaries last summer of ARS research on irrigation with brackish or salty water.

Using information developed by ARS soil scientists at the Virginia Truck Experiment Station, Norfolk, several producers grew vegetables and berries—despite drought—by irrigating with brackish water.

Water containing 2,000 parts per million of salt saved the first crop of strawberries on an extensive acreage in Virginia, although such water is too salty for continuous use. By following the scientists' recommendations, the producer successfully irrigated cabbage and potatoes as well as the berries.

Irrigate cauliflower, snap beans

Similarly, a grower at Currituck, N.C., irrigated moderately salt-tolerant cauliflower in 1959 with brackish water that had a salt concentration of 3,000 p.p.m. Another grower got good yields of snap beans, which have poor salt tolerance, by irrigating with water containing 1,000 p.p.m. of salt.

Vegetable growers in Delaware, Maryland, Virginia, and North Carolina often need to supplement rainfall by irrigating. Both quantity and quality of their crops may be reduced by moisture deficiency at critical growth stages, such as is the case during fruit formation.

Sources of good-quality irrigation water are often limited along the Eastern Seaboard, but brackish water is available in coastal inlets or creeks, in ponds bordering coastal marshes, and from wells contaminated by salt water. Bays, sounds, and rivers are other potential sources of brackish water.

Scientist outlines conditions

Research led by ARS soil scientist Jesse Lunin has outlined the conditions for emergency irrigation with brackish water. The amount used depends on the salt tolerance of the crop, the amount of salt in the water, the number of irrigations between rains of sufficient intensity to wash accumulated salt from the soil, and the salt content of the soil before irrigation.

Studies at the U.S. Salinity Laboratory, Riverside, Calif., and Norfolk

In irrigating with brackish water, the researchers tested various combinations of salt concentrations, frequency of application, and amounts of water.

have established the relative salt tolerance of vegetable crops as follows:

- Good tolerance: Garden beets, kale, asparagus, and spinach.
- Moderate tolerance: Tomatoes, broccoli, cabbage, potatoes, lettuce, sweet corn, peppers, squash, onions, peas, and cucumbers.
- Poor tolerance: Radishes, celery, and green beans.

Most vegetables are more tolerant of brackish water as they approach maturity and are most easily damaged as seedlings.

Table lists crop tolerance

Lunin has developed a ready-reference table for determining the permissible number of brackish water irrigations betwen leaching rains, assuming no salt accumulation in the soil. Water containing 1,920 p.p.m. total salts, for example, can safely be used for seven irrigations on asparagus or other vegetables with good tolerance, for five irrigations on moderately tolerant cabbage, and twice on easily damaged radishes.

The scientist advises determining the amount of salt in brackish water by measuring its electrical conductivity. Technicians of USDA's Soil Conservation Service or State agricultural experiment stations can tell farmers where to send their water samples for analysis.

In humid areas—unlike the arid West—salt seldom accumulates in the soil from one season to the next. The salt left in the soil from use of brackish water during the summer is normally leached out by winter rains.

However, if a fall vegetable crop is to be irrigated on land where brackish water was applied on a spring crop, Lunin advises testing the soil for salt content. He warns that salt may increase the acidity of eastern acid soils and may subject the crop to damage by the toxic aluminum, iron, or manganese that is often present in these soils.☆

A Plastic Covered...

GREEN-THUMB GREENHOUSE

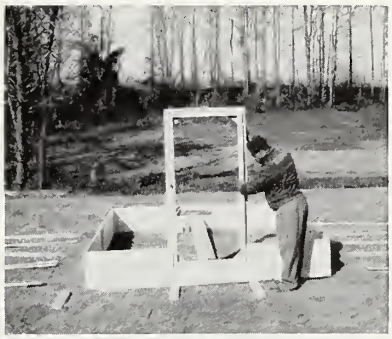
Poinsettias in December. Tomatoes in February. Lilies at Easter. A plastic-covered greenhouse can make these a reality for every home gardener.

The greenhouse frame, 8½ feet wide by 12 feet long, can be built entirely of wood with simple hand tools. The roof can be covered with a single 12- by 16-foot sheet of polyethylene or polyvinyl chloride plastic.

ARS engineers built a full-size model at Beltsville, Md., for a total materials cost of only $40.

The architectural feature of the greenhouse is its gothic-arch roof. The side ribs—¼-inch plywood, 4 inches wide and 8 feet long—are attached to the ridge beam, arched into position, and fastened to the sandbox-like base. The base is built of 1 by 8's.

A large-scale working drawing (Plan No. 5946, Plastic-Covered Greenhouse) is available from extension agricultural engineers at most State agricultural colleges. There is usually a small charge.



ABOVE—Once the sandbox-like base has been assembled, door frames are built and installed in each end. BELOW—Side ribs of quarter-inch plywood—double thickness—are fastened to the ridge beam and then to the base.

BOTTOM LEFT—The completed frame is ready to be covered with a low-cost polyethylene film. Triangular openings (above the doors) with hinged plywood covers control ventilation. BOTTOM RIGHT—The finished greenhouse can be moved short distances by two men.

Housing for the Elderly

Specialists study living habits of senior citizens—design safe, economical units

■ Urban apartment units geared to the comfort and safety of older people—especially those with low incomes—have been designed by ARS housing specialists.

Applying knowledge gained from research on housing requirements of rural families, the specialists at Beltsville, Md., gave particular attention to ease of moving about in the dwelling. Many falls among older people result from their unsureness of gait, lack of balance, and unsteadiness of hand. Such accidents can be reduced by uncluttered passageways, plenty of natural light, and easy accessibility from one area to another.

Before developing the designs, which were requested by the Public Housing Administration, the housing specialists visited elderly homemakers living in existing public housing units in Washington, D.C. They wanted to find out whether the amount of living and storage space considered desirable for rural housing could be adapted to the needs of the elderly in a metropolitan area.

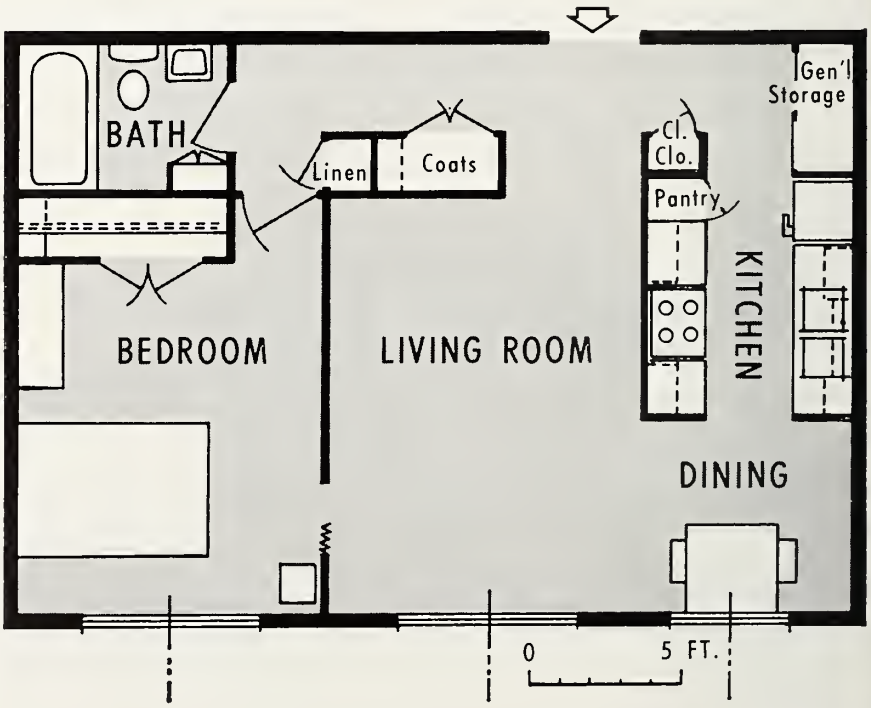
In these visits, the researchers found a more pronounced need for improvement in kitchens than in other rooms. Only the first shelf of most wall cabinets, for example, was low enough to be readily usable—and more than half of the tenants expressed a desire for lower wall cabinets.

The approach used by the housing staff in developing the recommendations could also be useful to architects and others helping with the planning of various types of housing. Here are some specific recommendations included:

- Provide counters in segments that are at least 24 inches wide in all kitchens for mixing and preparing foods. If the counter extends around a corner as it does in L and U arrangements, one of the arms of the counter should extend at least 18 inches beyond the corner.
- Consider a conventional range 30 inches or less in width rather than a wall oven and built-in cook top. Work surface is usually at a premium in low-cost dwellings, and a wall oven eliminates at least two feet of counter space.
- Use upright free-standing refrigerators, which require less stooping than the undercounter type.
- The location of the entrance door should be convenient to the kitchen to facilitate the use of grocery carts for bringing in food supplies. Many of the tenants visited by the housing staff had these carts, which would be useful also for moving laundry and cleaning supplies from one area to another.

In line with these recommendations, the housing specialists developed plans for apartments and separate plans for kitchens, both of which are published in "Housing for the Elderly" (ARS 63–1). This publication contains many useful suggestions for tailoring housing to suit the needs of the elderly. It also covers adequate and properly located storage space for clothing, outdoor wraps, cleaning supplies, and linens.

Single free copies of ARS 63–1 are available from the Clothing and Housing Research Division, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md.☆



AGRISEARCH NOTES

Growth chamber speeds screening

A plant growth chamber is being used to develop grasses for southwestern ranges that will be superior to present varieties in their ability to survive the crucial seedling stage of growth.

Many efforts to reseed arid or semiarid ranges in the Southwest fail because grasses now available lack sufficient drouth tolerance as seedlings.

ARS research agronomist L. N. Wright has demonstrated that, with a growth chamber, scientists can subject grasses to environmental conditions that will test their ability to survive under actual range conditions. The research is being conducted on a cooperative basis between ARS and the Arizona Agricultural Experiment Station.

Screening and evaluation offer the best prospect for developing grasses with improved seedling tolerance, Wright says, and the growth chamber should greatly speed up this process.

Mass screening of grass plants under range conditions not only is expensive, but it requires many years under fluctuating environmental conditions. Perhaps the most important feature of seedling evaluation in growth chambers is that environmental control enables researchers to evaluate thousands of plants in a comparatively short time.

Wright tested the accuracy of the growth-chamber method by growing grasses with known seedling drouth tolerance. Results indicate that the growth-chamber method of evaluation is accurate: Drouth tolerance as determined in the chamber was similar to the known drouth tolerance of the grasses under range conditions.

Healing time of pruning wounds

Pruning wounds on American elm trees usually need plant protection against fungus infection for periods of 4 to 8 years, depending upon the diameter of the wound.

Plant pathologist Curtis May recorded the length of time required for pruning wounds to close on a group of American elms growing in the wild in New Jersey. Healing time was then correlated with the diameter of the wound. The results show that—

Of 280 wounds that were 2.5 inches in diameter or smaller, 54 percent were covered over by a protective

callus at the end of 4 years, 87 percent had healed at the end of 7 years, and 92 percent had healed after 8 years.

Of the wounds 2.6 to 3.5 inches in diameter, only 29 percent had healed in 4 years, and 14 percent were still unhealed at the end of 8 years. Of the large wounds, 3.6 to 4.5 inches in diameter, only 10 percent had healed at the end of 4 years.

Pruning wounds, particularly the larger, slow-healing wounds, should be painted at intervals of about 3 years to protect the unhealed portion.

When do peppers need nitrogen?

A leaf tissue test can show whether soil has a deficiency of nitrogen sufficient to reduce sweet pepper yields, preliminary ARS tests show.

ARS soil scientists J. R. Thomas and M. D. Heilman found that yield can be predicted by measuring the nitrogen content of recently matured pepper leaves at the time the plants begin flowering. For optimum production, the leaves should then contain about 5 percent nitrogen the scientists say. If additional fertilizer is needed, it can be added early enough to increase the yield.

Although the procedure is still experimental, further research may develop a test that can be used routinely by commercial pepper producers in the Lower Rio Grande Valley. Research was at Weslaco, Tex., in cooperation with the Texas Agricultural Experiment Station.

Thomas and Heilman found that the amount of nitrogen in the leaves decreased during the heavy fruiting period of plant development, suggesting that the nitrogen moved from the leaves to the fruit. Statistical analysis showed that differences in the amount of nitrogen in leaf tissue accounted for 69 to 81 percent of the variations in yield.

The researchers conducted the experiment on irrigated sweet peppers of the Yolo variety, grown on Laredo fine sandy loam soil. They planted the peppers in July in double rows in beds 40 inches apart. Harvest began November 1.

UNITED STATES GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS, WASHINGTON, D.C. 20402

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300 (GPO)

AGRISEARCH NOTES

Plastic honeycombs undergo tests

Plastics have played an important role in the marketing of honey; they may play an even more vital part in its production.

ARS agricultural engineers at the Wisconsin and Arizona Agricultural Experiment Stations are experimenting with plastic honeycombs and frames that could be mass produced in one piece. Beekeepers now buy beeswax honeycombs, which they place in wooden frames.

B. F. Detroy at Madison, Wis., and C. D. Owens at Tucson, Ariz., have successfully tested plastic honeycombs and frames for 2 years. They have found that plastic is more durable

than wood, maintains its shape better, and is more uniform.

Owens says the plastic frames should increase the efficiency of a mechanical honeycomb uncapper (see AGR. RES. June 1963, p. 15), which he invented. Plastic frames will not swell and jam the machine as wooden frames sometimes do.

Plastic combs may also prove useful in helping control foulbrood and other bee diseases, because plastics can be sterilized after each use by boiling them in water. Present-day beeswax combs naturally would melt in boiling water.

The engineers are testing several types of thermoplastics with various cell sizes and in various colors. So far, they have tested green, black, milky white, clear, and several shades of yellow. Limited testing indicates that bees prefer dark colors.

Plastic combs are also being checked for effect on honey yield.

New director of human nutrition

W. A. Gortner, new director of the Human Nutrition Research Division, ARS, has had broad experience in both public and private research organizations.

For the last 16 years, he has been an administrator of research with the Pineapple Research Institute. Before that, he spent 5 years as a professor of biochemistry and coordinator of research on frozen food at Cornell University.

His experience also includes 5 years as a research chemist for General Mills, Inc., and 3 years as a teacher at the University of Rochester's Medical School. He has served as a consultant and research biochemist on various aspects of food and human nutrition research, including atherosclerosis and aging, pesticides in foods, and enzymes and glycoprotein.

Director Gortner is a native of Cold Spring Harbor, Long Island, N.Y., and holds a Ph.D. in biochemistry from the University of Rochester. He has authored two books and many technical reports and is a member of several professional and honorary societies.

Wool output and fertility

Sheep breeders should keep in mind, when selecting breeding stock, that ewes produce less wool while raising lambs.

Studies show that if selection is made solely on the basis of wool production—without regard to the number of lambs produced and nursed—less fertile ewes may be favored and future lamb production seriously reduced.

G. M. Sidwell, ARS sheep geneticist, and E. R. Ray, animal husbandman, New Mexico State University, found that lactation generally had a greater effect than pregnancy in reducing wool production. The investigations were conducted at the Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, N. Mex.

Sidwell and Ray observed ewes for wool production according to breeding groups, year in which the study was made, age of ewe, single or twin pregnancy, lactation, and dry ewes.

In one study, ewes that remained dry produced about 20 percent more wool than ewes that gave birth to twin lambs in the spring, lactated during the summer, weaned the lambs in the fall, then later the same fall became pregnant again with twin lambs.

The scientists noted smaller differences in wool production between dry ewes and ewes producing a single lamb, ewes weaning a single lamb, and ewes that gave birth to single or twin lambs in the spring but did not lamb in the fall.